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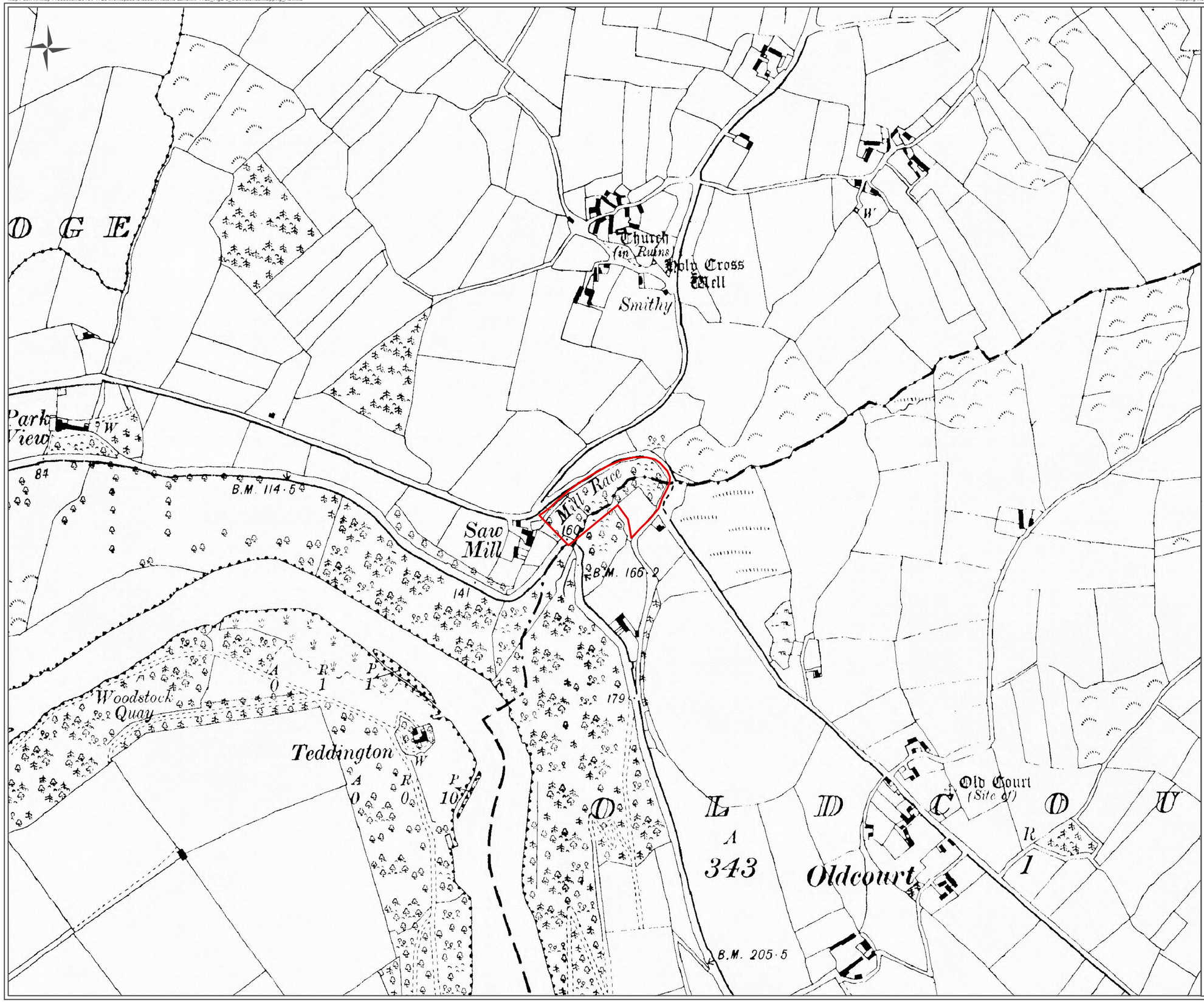

Meters
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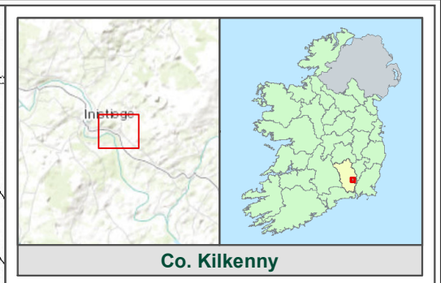

Legend

Site Boundary

Figure Title	OSi Historical Mapping
Figure No.	2.8
Project	Historical Landfills: Oldcourt
Client	Kilkenny County Council
Scale	1:5,000
Page Size	A3
Revision	A
Date	24/08/2018

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Map Path: R:\Map Production\2018\P1725\Workspace\Oldcourt Historic Landfill\P1725_Fig2-9_GeologicalHeritage_A3.mxd

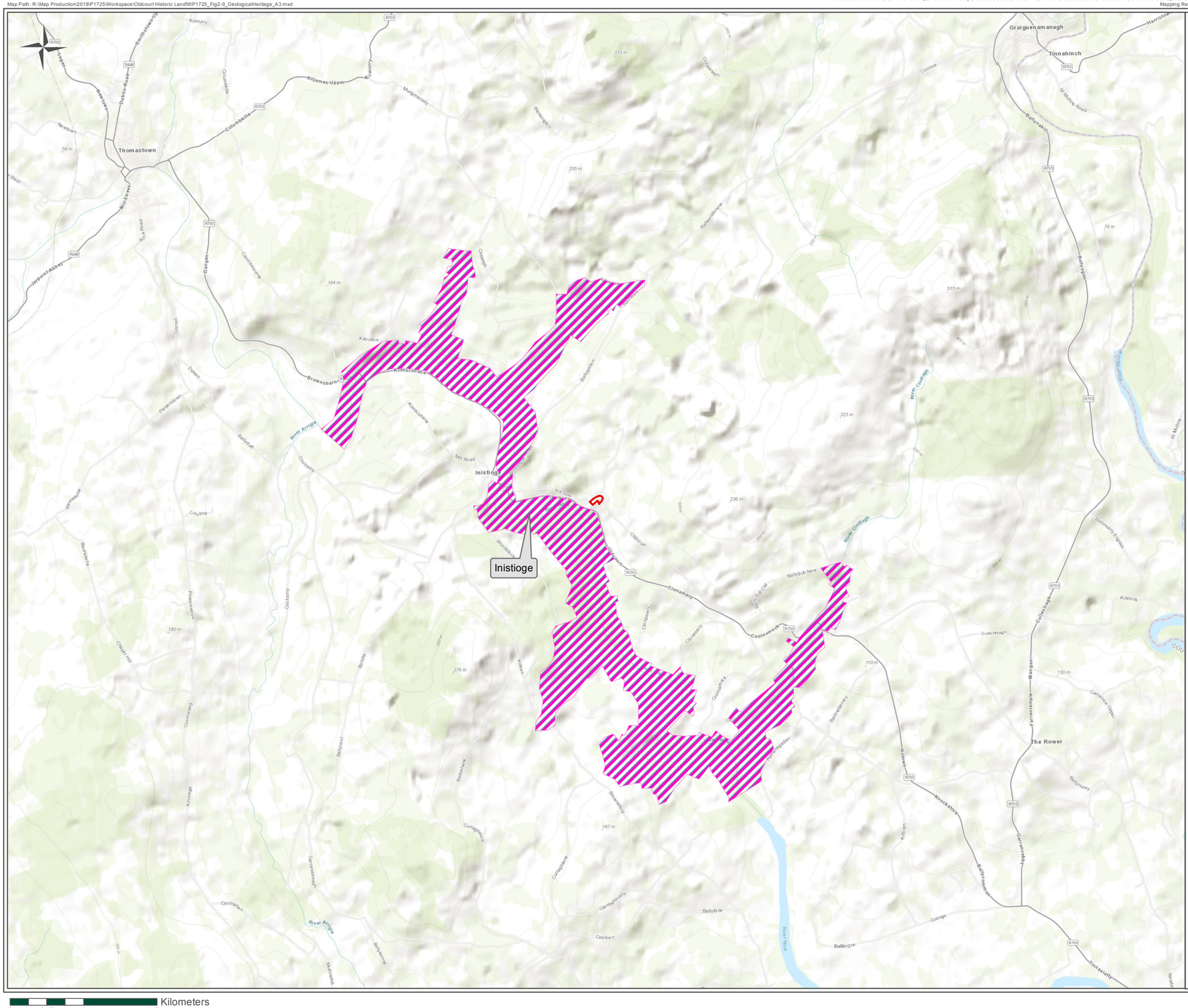

Figure Title
Geological Heritage

Figure No. 2.9

Project
Historical Landfills: Oldcourt

Client
Kilkenny County Council

Scale	1:50,000	**Page Size**	A3
Revision	A	**Date**	24/08/2018

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3 TIER 2 SITE INVESTIGATION

3.1 Site Investigation Works

A site investigation rationale was devised based on findings of the Tier 1 Site, a detailed site walkover, historical aerial photography and the preliminary risk assessment which formed part of the Tier 1 report.

The scope of site investigation works included:

- 2 No. machine excavated trial pits (TP04, TP05)
- 3 No. hand dug trial pits (TP01, TP02, TP03)
- 2 No. boreholes by light percussion methods for window sampling
- Factual reporting

The site investigation included the review of the following literature sources and websites:

- EPA 2003, Landfill Manuals: Landfill Monitoring (2nd Edition)
- EPA 1999, Landfill Manuals: Site Investigations
- CLR Report No. 4 1994 – Sampling Strategies for Contaminated Land, DoE, Contaminated Land Research (CLR) Report
- BS 5930: 1999, Code of Practice for Site Investigations
- BS 10175: 2000, Investigation of Potentially Contaminated Sites – Code of Practice
- BS 6068 Water Quality: Sampling (parts 6.1-6.6 and 6.11-6.12, 6.14)
- BS 8855 Soil analysis (all parts)
- CLM: Ready Reference 2002, Section 3.1 Soil sampling strategies
- CLM: Ready Reference 2002, Section 3.2 Groundwater sampling/monitoring strategies
- CLM: Ready Reference 2002, Section 3.3 Gas sampling/monitoring strategies

3.1.1 Site Walkover

A site walkover was conducted prior to site investigation works by KCC and an FT representative on the 21st August 2018. The site comprises very steep slopes, sloping from the northern site boundary down to the south west. A stream runs along the inside of the northern boundary, parallel to the local road north of the site boundary. Access along the slopes and the stream by machinery is not possible.

Prior to the site walkover the site investigation proposed to advance 10 No. trial pits and install 3 No. monitoring wells. However due to the inaccessibility of the majority of the site, the proposed site investigation works were revised. Alternatively, it was proposed to advance trial pits by hand digging within the above the stream banks which were accessible in the north and west of the site. In the east there was a larger area of flat ground, although overgrown with bushes and trees. It was proposed to advance trial pits using a 3T excavator in this area where possible, and advance exploratory boreholes by light percussion boring techniques to collect window samples.

The site walkover checklist and photo log are included in Appendix 2.

Map Path: R:\Map Production\2018\P1725\Workspace\Oldcourt Historic Landfill\P1725_Fig3-1_SiteInvestigation_A3.mxd

Legend

- Site Boundary
- Borehole Location
- Trial Pit Location

ID	X (ITM)	Y (ITM)
BH01	664919	637535
BH02	664945	637536
TP01	664892	637550
TP02	664867	637526
TP03	664838	637508
TP04	664932	637542
TP05	664956	637527

0 50 100 200 Meters

Figure Title
Site Investigation
Exploratory Holes Location Plan

Figure No. 3.1

Project
Historical Landfills: Oldcourt

Client
Kilkenny County Council

Scale	1:1,500	**Page Size**	A3
Revision	A	**Date**	18/01/2019

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3.1.2 Trial Pitting and Window Sampling

Following the site walkover, the intrusive site investigation was undertaken by Causeway Geotech Ltd. (CGL) on the 3rd and 4th of October 2018, under the supervision of CGL Engineering Geologist.

A total of 3 no. hand dug pits (TP01–TP03), 2 no. machine dug trial pits (TP04–TP05) and 2 no. window samples (BH01-BH02) were advanced. The exploratory hole locations are shown in Figure 3.1.

The hand dug pits were advanced using hand tools to a depth of 1.0 to 1.2m. The machine dug trial pits were advanced using a 3T tracked excavator fitted with a 600mm wide bucket to a depth of 2.0 and 3.0m.

The window samples were achieved using light percussion boring techniques with a Dando Terrier dynamic sampling rig. A depth of 3.8 and 3.0 m was achieved in BH01 and BH02 respectively.

Groundwater was not encountered in any of the exploratory holes.

A summary of the ground conditions is presented in Tables 3.1 below with photographs and exploratory hole logs provided in the CGL site investigation report, Appendix 3.

Table 3-1: Summary of Ground Condition

Trial Pit	Total Depth	Description of Materials Encountered
TP01	1.0	Natural Ground
TP02	1.0	Natural Ground
TP03	1.2	Natural Ground
TP04	3.0	0.0 – 0.1 m Topsoil 0.1 – 3.0 m Made Ground Comprising slightly sandy clay and plastic bottles, glass bottles, plastic bags, pieces of steel, clothing and plastic fibre straps
TP05	2.0	0.0 – 0.1 m Topsoil 0.1 – 0.5 m Made Ground Comprising slightly sandy gravelly clay and plastic bottles, glass bottles, other plastics 0.5 – 0.8 m Made Ground Comprising ash material 0.8 – 1.6 m Made Ground Comprising slightly gravelly clay and plastic fragments 1.6 – 2.0 m Natural Ground
BH01	3.8	0.0 – 0.3 m Made Ground Comprising clayey sandy gravel and sandy gravelly clay with fragments of plastic, glass, concrete, metal and cloth 3.0 – 3.8 m Natural Ground
BH02	3.0	0.0 – 0.1 m Topsoil 0.1 – 2.0 m Made Ground Comprising clayey sandy gravel to 1.0m and gravelly sandy clay to 2.0 m, both strata contained low cobble content 2.0 – 3.0 m Natural Ground

Natural ground comprising gravelly sands and silts were encountered in the hand dug pits. Neither waste nor made ground were encountered in the 3 no. hand dug pits.

Made ground was encountered in the two machine dug trial pits, TP04 and TP05. The made ground comprised clay with fragments of plastics, glass bottles, steel and cloth. TP04 was terminated at 3.0m due to the maximum reach of the excavator and the base of the made ground had not been reached. In TP05 natural underlaid the made ground at 1.6m.

Made ground was encountered in both window sample boreholes to a depth of 3.0 and 2.0 m in BH01 and BH02 respectively. The made ground in BH01 comprised gravel and clay with fragments of plastics, concrete, glass, metal and cloth. The made ground in BH02 comprised sandy gravelly clay and sandy clayey gravel and no waste materials.

3.1.3 Soil Sampling

2 No. samples of the made ground were collected from the boreholes in the eastern side of the site (BH01 and BH02).

All samples were submitted for Waste Acceptance Criteria (WAC) testing to Chemtest, a UKAS/MCERTS approved laboratory. Samples were collected from site under Chain of Custody procedures.

The results are included in the CGL site investigation report in Appendix 3.

3.1.4 Evidence of Contamination

The trial pit excavation and window sampling works identified made ground comprising fragments of waste on the eastern half of the site. The hand dug pits excavated on the western half of the site identified natural ground only. The made ground encountered in TP04 and TP05 comprised sandy gravelly clay with fragments plastic bottles, glass bottles, plastic bags, pieces of steel, clothing and plastic fibre straps. Approximately 300mm of a light orange brown ash like material was encountered in TP05.

The window sampling identified clayey sandy gravel and sandy gravelly clay with fragments of plastic, glass, concrete, metal and cloth in BH01 and made ground comprising clay and gravel in BH02.

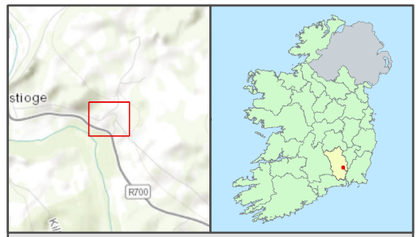
No visual or olfactory evidence of putrescible / biodegradable waste was noted by CGLs supervising Geologist during the site investigation.

3.1.5 Waste Delineation

The natural material encountered in the hand dug pits suggest waste was not buried along the upper bank of the stream between where it enters and exits the site. Waste encountered in TP04, TP05, BH01 and BH02 suggests the waste deposition was confined to the eastern side of the site where the area of flatter ground is located.

Based on this interpretation, the maximum waste footprint is calculated to be approximately 0.14 hectares instead of the 0.6 hectares previously assumed based on anecdotal evidence. The maximum anticipated waste footprint is presented in Figure 3-2.

Map Path: R:\Map Production\2018\P1725\Workspace\Oldcourt Historic Landfill\P1725_Fig3-2_MaximumAnticipatedWasteFootprint_A3.mxd



Co. Kilkenny

Legend

- Site Boundary
- Estimated Waste Footprint

0 50 100 200 Meters

Figure Title
Maximum Anticipated Waste Footprint

Figure No. 3.2

Project
Historical Landfills: Oldcourt

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4 ENVIRONMENTAL ASSESSMENT

4.1 Chemical Assessment Criteria

- Council Decision 2003/33/EC – Waste Classification Acceptance Criteria
- European Communities Environmental Objectives (Surface Waters) (Amendment) Regulations, 2012 (S.I. No. 327 of 2012)
- European Communities Environmental Objectives (Surface Waters) Regulations, 2009 (S.I No. 272 of 2009)
- European Communities (Quality of Surface Water Intended for the Abstraction of Drinking Water) Regulations, 1989 (S.I. No. 294/1989).

The results of the environmental assessment at the Oldcourt Historic Landfill site are presented in the following sections.

4.2 Soil / Made Ground Assessment

The soil / made ground samples analysed during this assessment have been compared against the Waste Acceptance Criteria (WAC) to determine the appropriate waste classification rating associated with the identified waste. WAC screening is chosen for this assessment to suitably categorise the interred waste as inert, non-hazardous or hazardous material.

4.2.1 Chemical Results for Soil Samples

The soil samples analysed from the site investigations were assessed against the Waste Classification Assessment Criteria to determine the broad classification of waste landfilled. A summary of the results for are outlined in Table 4.1 below, while the laboratory reports are presented in CGL site investigation report in Appendix 3.

4.2.2 Waste Classification

Based on the 2 No. soil samples submitted for laboratory waste acceptance criteria (WAC) testing and the representative spread across the site, analysis of waste samples from the trial pits excavated indicate that the waste material encountered within the site is inert waste.

Table 4-1: Soil Sampling Results – Solid Waste Analysis

Parameter	Units	Inert Waste Acceptance Criteria	Non-Hazardous Waste Acceptance Criteria	Hazardous Waste Acceptance Criteria	Sampling Results - Sample ID	
					BH01 (3.0 m)	BH02 (1.0 m)
Arsenic	$mg.kg^{-1}$	**0.5**	**2**	**25**	< 0.0010	0.0011
Barium	$mg.kg^{-1}$	**20**	**100**	**300**	0.0026	0.0032
Cadmium	$mg.kg^{-1}$	**0.04**	**1**	**5**	< 0.00010	< 0.00010
Chromium	$mg.kg^{-1}$	**0.5**	**10**	**70**	< 0.0010	< 0.0010
Copper	$mg.kg^{-1}$	**2**	**50**	**100**	< 0.0010	< 0.0010
Mercury Dissolved	$mg.kg^{-1}$	**0.01**	**0.2**	**2**	< 0.00050	< 0.00050
Molybdenum	$mg.kg^{-1}$	**0.5**	**10**	**30**	< 0.0010	< 0.0010
Nickel	$mg.kg^{-1}$	**0.4**	**10**	**40**	< 0.0010	< 0.0010
Lead	$mg.kg^{-1}$	**0.5**	**10**	**50**	< 0.0010	< 0.0010
Antimony	$mg.kg^{-1}$	**0.06**	**0.7**	**5**	< 0.0010	< 0.0010
Selenium	$mg.kg^{-1}$	**0.1**	**0.5**	**7**	< 0.0010	< 0.0010
Zinc	$mg.kg^{-1}$	**4**	**50**	**200**	0.0014	0.0020
Chloride	$mg.kg^{-1}$	**800**	**15000**	**25000**	3.2	9.0
Fluoride	$mg.kg^{-1}$	**10**	**150**	**500**	0.10	0.12
Sulphate	$mg.kg^{-1}$	**1000**	**20000**	**50000**	2.9	6.9
Total Dissolved Solids	$mg.kg^{-1}$	**4000**	**60000**	**100000**	27	25
Total Monohydric Phenols	$mg.kg^{-1}$	**1**	**--**	**--**	< 0.030	< 0.030
Dissolved Organic Carbon	$mg.kg^{-1}$	**500**	**800**	**1000**	13	11
Total Organic Carbon *	%	**3**	**5**	**6**	2.0	2.7
Loss on ignition	%	**--**	**--**	**10**	5.6	5.9
Sum of BTEX	$mg.kg^{-1}$	**6**	**--**	**--**	< 0.010	< 0.010
PCBs (Sum of 7)	$mg.kg^{-1}$	**1**	**--**	**--**	< 0.10	< 0.10
Mineral Oil	$mg.kg^{-1}$	**500**	**--**	**--**	39	60
PAH (Sum of 17)	$mg.kg^{-1}$	**100**	**--**	**--**	6.2	16
pH	pH units	**>6 or <9**	**>6**	**--**	8.1	8.3
Moisture Content ratio	%	**--**	**--**	**--**	29	12

* ND – non-detected
* Hazardous Waste Landfill Criteria: >6% TOC

4.3 Surface Water Monitoring

4.3.1 Monitoring Locations

The surface water monitoring locations were selected along the Woodstock Park stream, upstream and downstream of the landfill footprint, as shown on Figure 4.1. One surface water monitoring round was carried out on the 27th September 2018.

4.3.2 Monitoring Parameters

The results of surface water sampling analysed from the 2 No. sampling locations (SW1 and SW2) at the site have been assessed against the Maximum Admissible Concentration (MAC) Regulations (1989) and the Environmental Quality Standard (EQS) for Surface Waters Regulations (2009) assessment criteria.

A summary of the maximum values reported for each parameter from the single monitoring round is outlined in Table 4.2, while the laboratory reports are presented in Appendix 4.

Table 4-2: Surface Water Sampling Results

Parameter	Units	MAC [1]/EQS [2]	27/09/2018	
			SW1 (Upstream)	SW2 (Downstream)
pH (Laboratory)	pH Units	6.0<pH<9.0[2]	7.37	7.05
Dissolved Oxygen	mg/l	<9 – 6 [1]	11.7	11.6
Conductivity	µS/cm	1 [1]	0.102	0.148
BOD, unfiltered	mg/l	≤2.6 (95%ile)[2]	<1	3.44
Sulphate	mg/l	200 [1]	7.3	21.3
Chloride	mg/l	250 [1]	12.7	14.2
Ammoniacal Nitrogen as N	mg/l	≤0.140(95%ile) [2]	<0.2	<0.2
Potassium	mg/l	--	0.464	0.841
Sodium	mg/l	200 [1]	8.36	8.52

Notes:

[1] Maximum Admissible Concentration (MAC), as classified by European Communities (Quality of Surface Water intended for abstraction of drinking water) Regulations 1989 (S.I No. 294 of 1989)

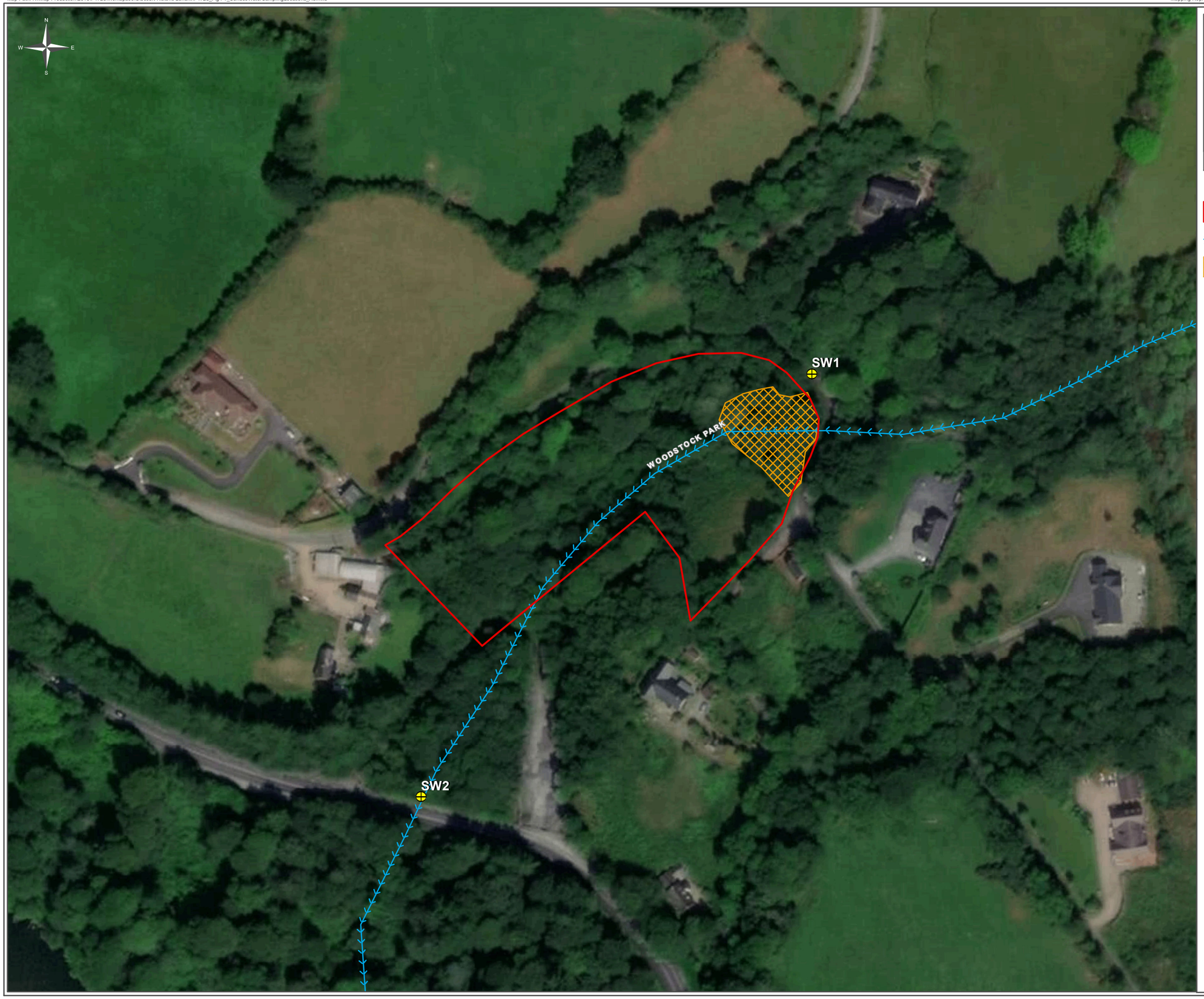
[2] Environmental Quality Standard (EQS), European Communities Environmental Objectives (Surface Waters) Regulations 2009 (S.I No. 272 of 2009)

4.3.3 Surface Water Analysis Discussion

The results of the surface water monitoring from SW1 and SW2 show 1 No. exceedances of the EQS (2009) guideline limit values for BOD. Results from the downstream (SW2) sampling locations detected a BOD concentration of 3.44 mg/l, greater than the guideline threshold of 2.6 mg/l.

The remaining results from SW1 and SW2 when assessed against the MAC (1989) and EQS (2009) quality standards were found to be below the guideline values in all assessments. It is noted that the results of surface water monitoring are based on one monitoring round and further monitoring would be beneficial to better understand the impact of the landfill, if any, on downstream water quality.

Map Path: R:\Map Production\2018\P1725\Workspace\Oldcourt Historic Landfill\P1725_Fig4-1_SurfaceWaterSamplingLocations_A3.mxd



Legend

- Site Boundary
- Rivers
- Estimated Waste Footprint
- Surface Water Sampling Points

ID	X (ITM)	Y (ITM)
SW1	664960	637541
SW2	664802	637370

Figure Title
Surface Water Sampling Locations

Figure No. 4.1

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Historical Landfills: Oldcourt

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5 RISK ASSESSMENT

5.1 Introduction

Risk assessment considers the likelihood of occurrence and the consequence of occurrence of an event (Royal Society, 1992[1]). ERA (Environmental Risk Assessment) is based on the development of a Conceptual Site Model (CSM) which is used to determine the potential exposure of a vulnerable receptor to a contaminant. The CSM is used as the basis for the risk assessment. It is used to identify all possible sources (S), pathways (P) and receptors (R) as well as the processes that are likely to occur along each of the source-pathway-receptor (S-P-R) linkages and uncertainties.

Based on the desktop investigation and completed site investigation, this CSM assumes the source to be the made ground containing waste deposit, the pathway to involve the migration of landfill gas, surface water and groundwater and the ultimate receptors to be the surface water features, groundwater, groundwater abstraction well and all human presence near the waste material.

5.2 Potential Pathways and Receptors

A pathway is a mechanism or route by which a contaminant encounters, or otherwise affects, a receptor. Contaminants associated with deposited waste may include leachate generated from groundwater/rainwater infiltration into the waste material and/or the generation of landfill gas from the degradation of the biodegradable fraction of deposited waste.

The potential pathways associated with the Oldcourt site are:

- Groundwater migration;
- Surface water infiltration; and
- Landfill gas migration.

5.2.1 Groundwater/Leachate Migration

According to the EPA CoP, there are three main pathways for leachate migration. These are:

- Vertically to the water table or top of an aquifer, where groundwater is the receptor
- Vertically to an aquifer and then horizontally in the aquifer to a receptor such as a well, spring or stream
- Horizontally at the ground surface or at shallow depth to a surface receptor

The migration and attenuation of leachate from the site depends on the permeability and thickness of subsoil and on both the bedrock permeability value and type. These elements are encompassed in groundwater vulnerability, groundwater flow regime and surface water drainage. The main receptors to leachate migration from this site are:

- Aquifer;
- Surface water features; and
- Human presence on or nearby the site

5.2.2 Landfill Gas Migration

According to the EPA CoP, there are two main pathways for landfill gas migration. These are:

- Lateral migration via subsoil
- Vertical migration via subsoil

[1] Royal Society 1992, Risk: Analysis, Perception and Management. The Royal Society, London (ISBN 0-85403-467-6).

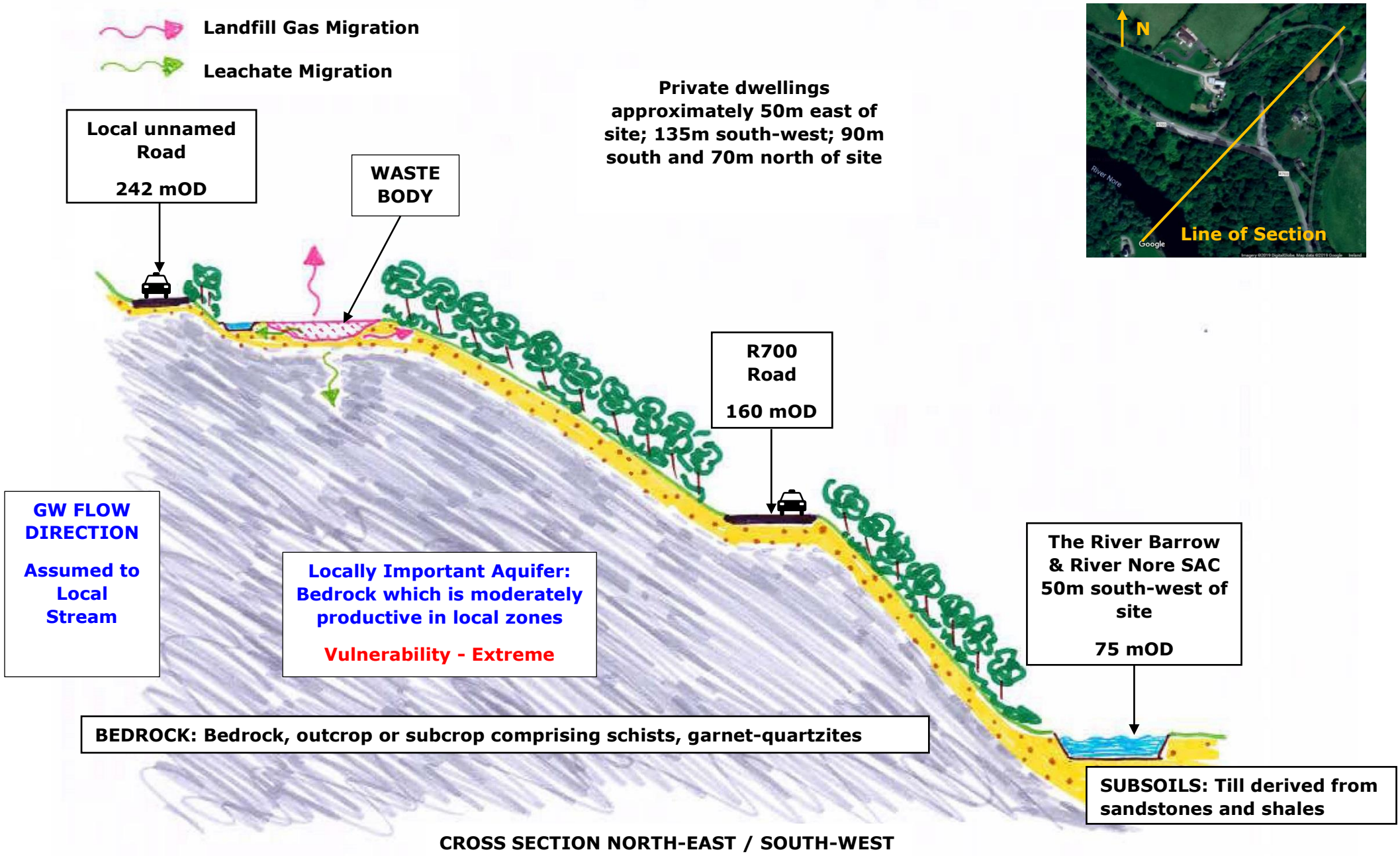
The migration of landfill gas from the site depends on the nature of the material deposited and the nature, permeability and thickness of the surrounding subsoil or bedrock.

The main receptors to potential landfill gas migration from this site are:

- Human Presence/Buildings on or nearby the waste body

5.3 Conceptual Site Model

Based on the desktop investigation and site investigation works undertaken for Oldcourt Historic Landfill, an assessment of the risk is made to confirm the source – pathway – receptor (S-P-R) linkages identified in the preliminary investigation. The results and analysis of the investigation has enabled a basic conceptual model to be produced for the site, which is presented in Figure 5.1, overleaf.



CROSS SECTION NORTH-EAST / SOUTH-WEST

FIGURE 5.1 OLDCOURT HISTORIC LANDFILL

CONCEPTUAL SITE MODEL

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5.4 Risk Prioritisation

Risk prioritisation enables resources to be prioritised on the highest risk facilities and on the highest source – pathway – receptor linkage potential.

The risk prioritisation process assigns a score to each linkage and the overall score is the maximum of the individual linkages for the site. The higher the score a site/linkage receives the higher the risk.

To classify the risk, scores will be applied to the information obtained during the site investigation of Oldcourt Historic Landfill. Where there is insufficient information available (i.e. where there is a high degree of uncertainty) the highest score is assumed.

In accordance with the EPA CoP (2007) the scoring matrices are as follows:

- Leachate: Source/hazard scoring matrix, based on waste footprint
- Landfill gas: Source/hazard scoring matrix based on waste footprint
- Leachate migration: Pathway (Vertical)
- Leachate migration: Pathway (Horizontal)
- Leachate migration: Pathway (Surface water drainage)
- Landfill gas: Pathway (Lateral migration potential)
- Landfill gas: Pathway (Upwards migration potential)
- Leachate migration: Receptor (Surface water drainage)
- Leachate migration: Receptor (Human presence)
- Leachate migration: Receptor (Protected areas – SWDTE or GWDTE) (Surface water/groundwater dependent terrestrial ecosystems)
- Leachate migration: Receptor (Aquifer category – Resource potential)
- Leachate migration: Receptor (Public water supplies – other than private wells)
- Leachate migration: Receptor (Surface water bodies)
- Landfill gas: Receptor (Human presence)

Table 5.1 calculates the points awarded to each of the headings listed above.

Table 5-1: Risk Classification Calculation – Oldcourt Landfill

EPA Ref	Risk	Points	Rationale
1a	Leachate; source/hazard scoring matrix, based on waste footprint.	2.5	A reduced score of 2.5 is applied due to the reduced waste footprint following intrusive investigation and the WAC results categorising the waste as inert. The waste footprint is ≤1ha and assumed municipal.
1b	Landfill gas; source/hazard scoring matrix, based on waste footprint.	2.5	A reduced score of 2.5 is applied due to the reduced waste footprint following intrusive investigation and the age and nature of the waste having limited gas migration potential. The waste footprint of ≤1ha and assumed municipal.
2a	Leachate migration: Pathway (Vertical)	3	GSI describes the groundwater vulnerability as Extreme across the site.
2b	Leachate migration: Pathway (Horizontal)	2	The bedrock is classified by the GSI as a Locally Important Bedrock Aquifer (Lg) – Moderately Productive only in Local Zones.

EPA Ref	Risk	Points	Rationale
2c	Leachate migration: Pathway (Surface water drainage)	2	A direct connection between the waste and Woodstock Park Stream was noted during site investigations
2d	Landfill gas: Pathway (Lateral migration potential)	2	The site consists of Bedrock, outcrop or subcrop throughout the site (as per GSI online mapping)
2e	Landfill gas: Pathway (Upwards migration potential)	0	No buildings or enclosed spaces above waste body.
3a	Leachate migration: Receptor (Human presence)	2	Residential dwelling greater than 50m but less than 250m from the waste body
3b	Leachate migration: Receptor (Protected areas – SWDTE or GWDTE) (Surface water/ groundwater dependent terrestrial ecosystems)	2	The nearest SAC/pNHA (River Nore) is located greater than 50m but less than 250m of the waste body.
3c	Leachate migration: Receptor (Aquifer category – Resource potential)	3	The bedrock is classified by the GSI as a Locally Important Bedrock Aquifer (Lg) – Moderately Productive only in Local Zones.
3d	Leachate migration: Receptor (Public water supplies – other than private wells)	0	The nearest known public water supply well is located greater than 1km from the waste body (no karst aquifer).
3e	Leachate migration: Receptor (Surface water bodies)	3	Woodstock Park stream within 50m of the site boundary.
3f	Landfill Gas: Receptor (Human presence)	3	Residential areas and farm buildings greater than 50 m but less than 150 m from the waste body.

Table 5-2: Normalised Score of S-P-R Linkage

Calculator		S-P-R Values	Maximum Score	Linkage	Normalised Score
Leachate migration through combined groundwater and surface water pathways					
SPR1	1a x (2a + 2b + 2c) x 3e	2.5 x (3+2+2) x 3 = **52.5**	300	Leachate => surface water	18%
SPR2	1a x (2a + 2b + 2c) x 3b	2.5 x (3+2+2) x 2 = **35**	300	Leachate => SWDTE	12%
Leachate migration through groundwater pathway					
SPR3	1a x (2a + 2b) x 3a	2.5 x (3+2) x 2 = **25**	240	Leachate => human presence	10%
SPR4	1a x (2a + 2b) x 3b	2.5 x (3+2) x 2 = **25**	240	Leachate => GWDTE	10%
SPR5	1a x (2a + 2b) x 3c	2.5 x (3+2) x 3 = **37.5**	400	Leachate => Aquifer	9%

Calculator		S-P-R Values	Maximum Score	Linkage	Normalised Score
SPR6	1a x (2a + 2b) x 3d	2.5 x (3+2) x 0 = **0**	560	Leachate => Surface Water	0%
SPR7	1a x (2a + 2b) x 3e	2.5 x (3+2) x 3 = **37.5**	240	Leachate => SWDTE	16%
Calculator	**S-P-R Values**		**Maximum Score**	**Linkage**	**Normalised Score**
Leachate migration through surface water pathway					
SPR8	1a x 2c x 3e	2.5 x 2 x 3 = **15**	60	Leachate => Surface Water	**25%**
SPR9	1a x 2c x 3b	2.5 x 2 x 2 = **10**	60	Leachate => SWDTE	17%
Landfill gas migration pathway (lateral & vertical)					
SPR10	1b x 2d x 3f	2.5 x 2 x 3 = **15**	150	Landfill Gas => Human Presence	10%
SPR11	1b x 2e x 3f	2.5 x 0 x 3 = **0**	250	Landfill Gas => Human Presence	0%
Site maximum S-P-R Score					**38%**
Risk Classification					**C – Low Risk**

Table 5.2 shows the maximum S-P-R scoring for the site is **38%.**

The following are the risk classifications applied:

- Highest Risk (Class A) Greater than 70 for any individual SPR linkage
- Moderate Risk (Class B) 41-69 for any individual SPR linkage
- Lowest Risk (Class C) Less than 40 for any individual SPR linkage

Based on this, the site can be classified as a **Low Risk Classification (Class C)**. The highest risk identified on the site is the potential for migration of leachate from the site to the adjacent surface water stream, the Woodstock Park stream. However, the site is classified Low Risk and the waste has been identified as inert hence the risk of leachate migration to the stream is low.

6 CONCLUSIONS & RECOMMENDATIONS

A Tier 2 study was conducted by FT in accordance with the EPA CoP for Oldcourt Historic Landfill. The study consisted of a desktop study, site walkover survey, intrusive site investigation works and surface water sampling. These works informed the development of the CSM and risk screening model.

Prior to the environmental monitoring at Oldcourt, the presence of dense vegetation overgrowth across the landfill was confirmed which had implications on the ability to conduct detailed intrusive works and associated groundwater monitoring at the site. Due to the dense tree cover, it was decided to reduce the scope of the investigative works to intrusive works where access allowed and to assess the surface water quality upstream and downstream of the site.

Analysis of surface water samples SW1 (upstream) and SW2 (downstream) when assessed against the MAC (1989) and EQS (2009) quality standards were found to be below the guideline values in all assessments, with the exception of BOD at the SW2. It is noted that these results are based on one monitoring round and further monitoring is recommended to better understand the impact of the landfill, if any, on downstream water quality.

The results of the Tier 2 assessment and risk model indicate that the site is a **Low Risk Classification (Class C)**. The highest risk identified at the site is the potential for migration of leachate from the site to the adjacent Woodstock Park stream. However, the site is classified Low Risk and the waste has been identified as inert hence the risk of leachate migration to the stream is low.

6.1 Recommendations

Based on the results of the initial Tier 2 assessment the site is classified as Low Risk. For a low-risk site, the CoP indicates that these sites are not considered to pose a significant risk to the environment or human health.

It is therefore recommended that this site can proceed with a Certificate of Authorisation application. FT recommends that surface water and analysis be undertaken at both monitoring locations, SW1 and SW2, monthly for three months prior to the Certificate of Authorisation application, and quarterly surface water monitoring thereafter subject to the conditions of the Certificate of Authorisation.

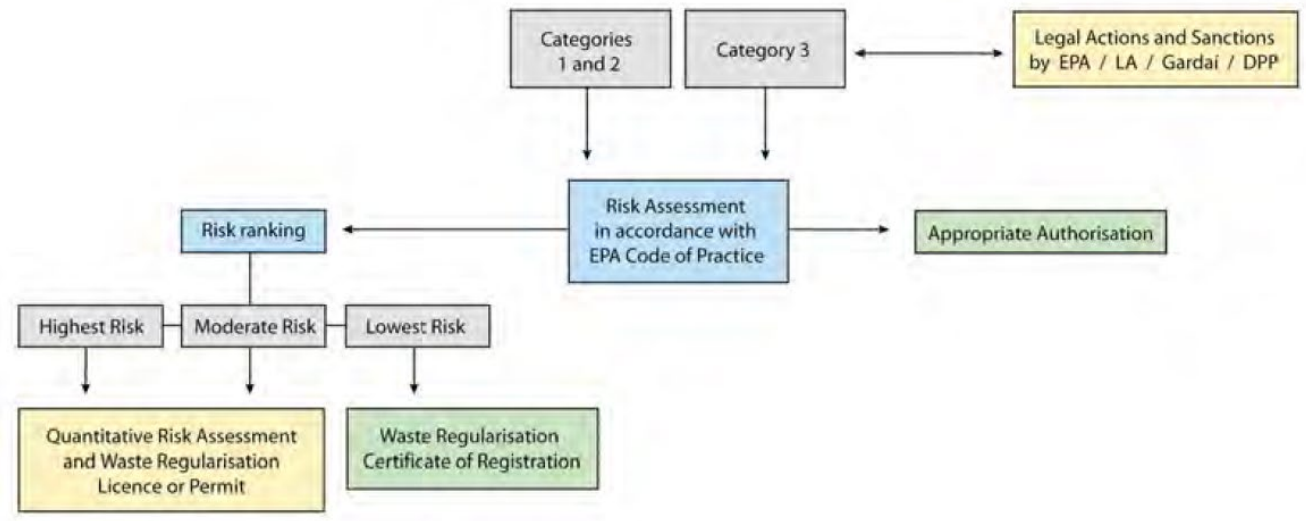


Figure 6-1: Extract from Section 1.3 of the EPA Code of Practice

Appendix 1

Tier 1 Study

T1 RISK SCREENING

SITE: Oldcourt, Inistioge

RISK: 50% - Medium Risk

TABLE		SCORE	RATIONALE
Source			
Leachate Hazard	1a	5	0.6ha, municipal waste
Landfill Gas Hazard	1b	5	0.6ha, municipal waste
Pathways			
Leachate Migration – Ground Water Vulnerability	2a	3	Extreme, rock near surface
Leachate Migration – Ground Water Flow Regime	2b	1	Ll, Locally Important Aquifer,
Leachate Migration – Surface Water Drainage	2c	2	Direct connection between waste body and adjacent surface water
Landfill Gas – Lateral Migration	2d	2	Bedrock
Landfill Gas – Vertical Migration	2e	3	Bedrock
Receptors			
Leachate Migration – Human Presence	3a	3	Within 50m of site
Leachate Migration – Protected Areas	3b	2	Greater than 50m, less than 250m
Leachate Migration – Aquifer Category	3c	3	Ll, Locally Important Aquifer
Leachate Migration – Public Water Supplies	3d	0	Greater than 1km, no karst
Leachate Migration – Surface Water Bodies	3e	3	Within 50m of site
Landfill Gas – Human Presence	3f	5	Within 50m of site

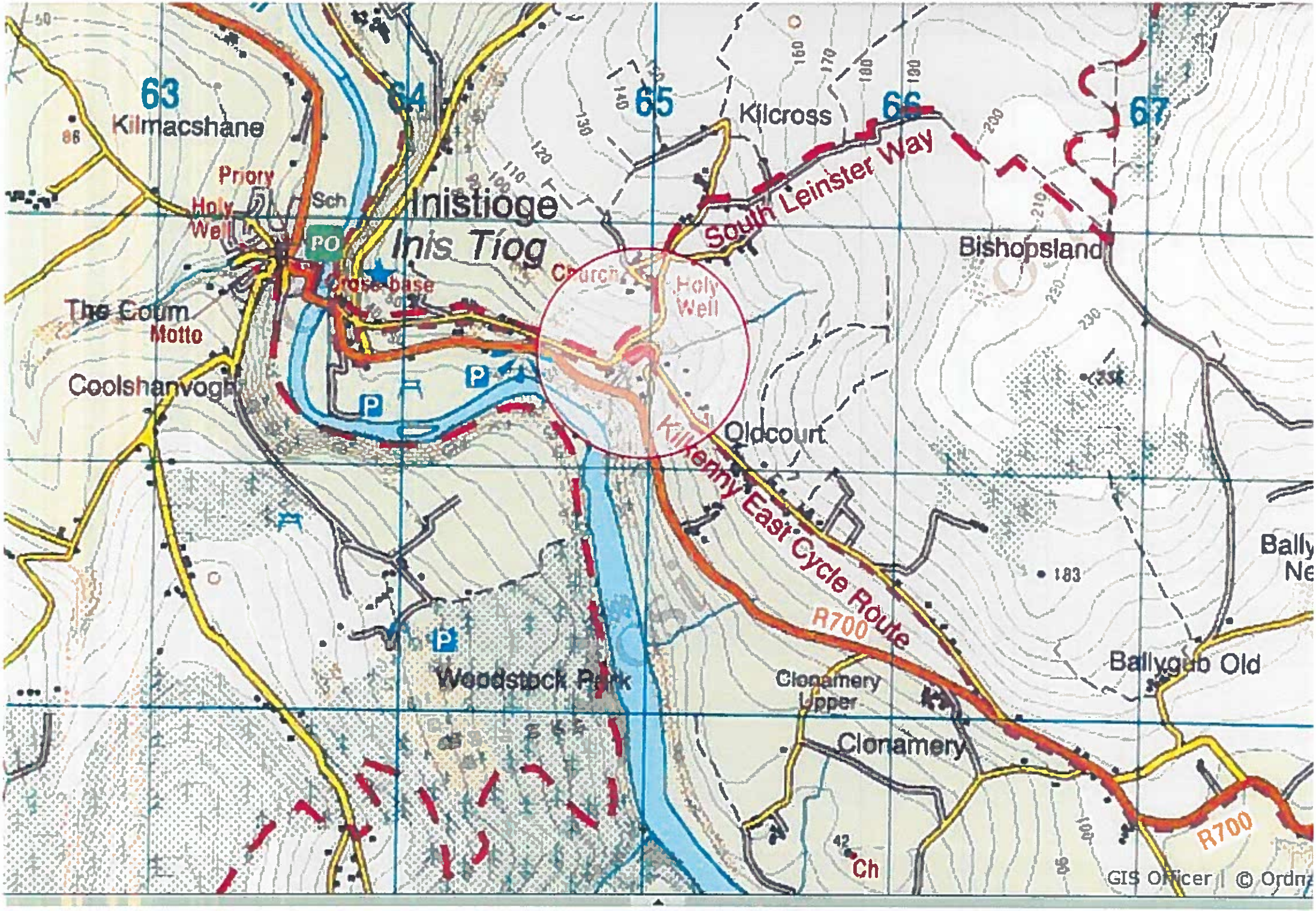
SPR LINKAGE SCORE			MAX LINKAGE SCORE	NORMALISED SCORE
SPR 1	1a X (2a + 2b + 2c) X 3e	90	300	30%
SPR 2	1a X (2a + 2b + 2c) X 3b (SWDTE)	60	300	20%
SPR 3	1a X (2a + 2b) X 3a	60	240	25%
SPR 4	1a X (2a + 2b) X 3b	40	240	16.67%
SPR 5	1a X (2a + 2b) X 3c	60	400	15%
SPR 6	1a X (2a + 2b) X 3d	0	560	0%
SPR 7	1a X (2a + 2b) X 3e	60	240	25%
SPR 8	1a X 2c X 3e	30	60	**50%**
SPR 9	1a X 2c X 3b (SWDTE)	20	60	33.33%
SPR 10	1b X 2d X 3f	50	150	33.33%
SPR 11	1b X 2e X 3f	75	250	30%

Moderate risk 50% based on SPR8 as per COP. The moderate risk is based on the surface migration of leachate to the adjacent surface water body (stream).
The other linkages were low risk.

Walkover Survey Checklist

Information	Checked	Comment (include distances from site boundary)
1. What is current Land Use?	✓	None
2. What are the neighbouring Land Uses?	✓	Agricultural/private residential
3. What is the size of the site?	✓	6000m2 – 0.6 ha
4. What is the topography?	✓	On hillside, fall to SW 1:7
5. Are there potential receptors (if yes, give details)?	✓	
• Houses	✓	Pp for house at 10m, number of other houses within 100m
• Surface water features (if yes, distance and direction of flow)	✓	
• Any wetland or protected areas	✓	NHA 1136m West SAC Nore, 56m to South
• Public Water Supplies	✓	4145m East
• Private Wells	✓	Potential dwelling 10m
• Services	✓	Water mains 10m
• Other buildings	✓	Ag bldgs 70m
• Other	✓	
6. Are there any potential sources of contamination (if yes, give details)?	✓	
• Surface waste (if yes, what type?)	✓	Yes site covered but tyres and bits of metal visible
• Surface ponding of leachate	✓	No
• Leachate seepage	✓	No
• Landfill gas odours	✓	No
7. Are there any outfalls to surface water? (If yes, are there discharges and what is the nature of the discharge?)	✓	River runs through it
8. Are there any signs of impact on the environment? (If yes, take photographic evidence)	✓	No
• Vegetation die off, bare ground	✓	No
• Leachate seepages	✓	No
• Odours	✓	No
• Litter	✓	Yes

Information	Checked	Comment (include distances from site boundary)
• Gas bubbling through water	✓	No
• Signs of settlement, subsidence, water logged areas	✓	No
• Drainage or hydraulic issues	✓	No
• Downstream water quality appears poorer than upstream water quality	✓	No
9. Are there any indications of remedial measures? (Provide details)	✓	
• Capping	✓	Soil grass
• Landfill gas collection	✓	No
• Leachate collection	✓	No
10. Describe fences and security features (if any)	✓	Fencing
Any other relevant information?		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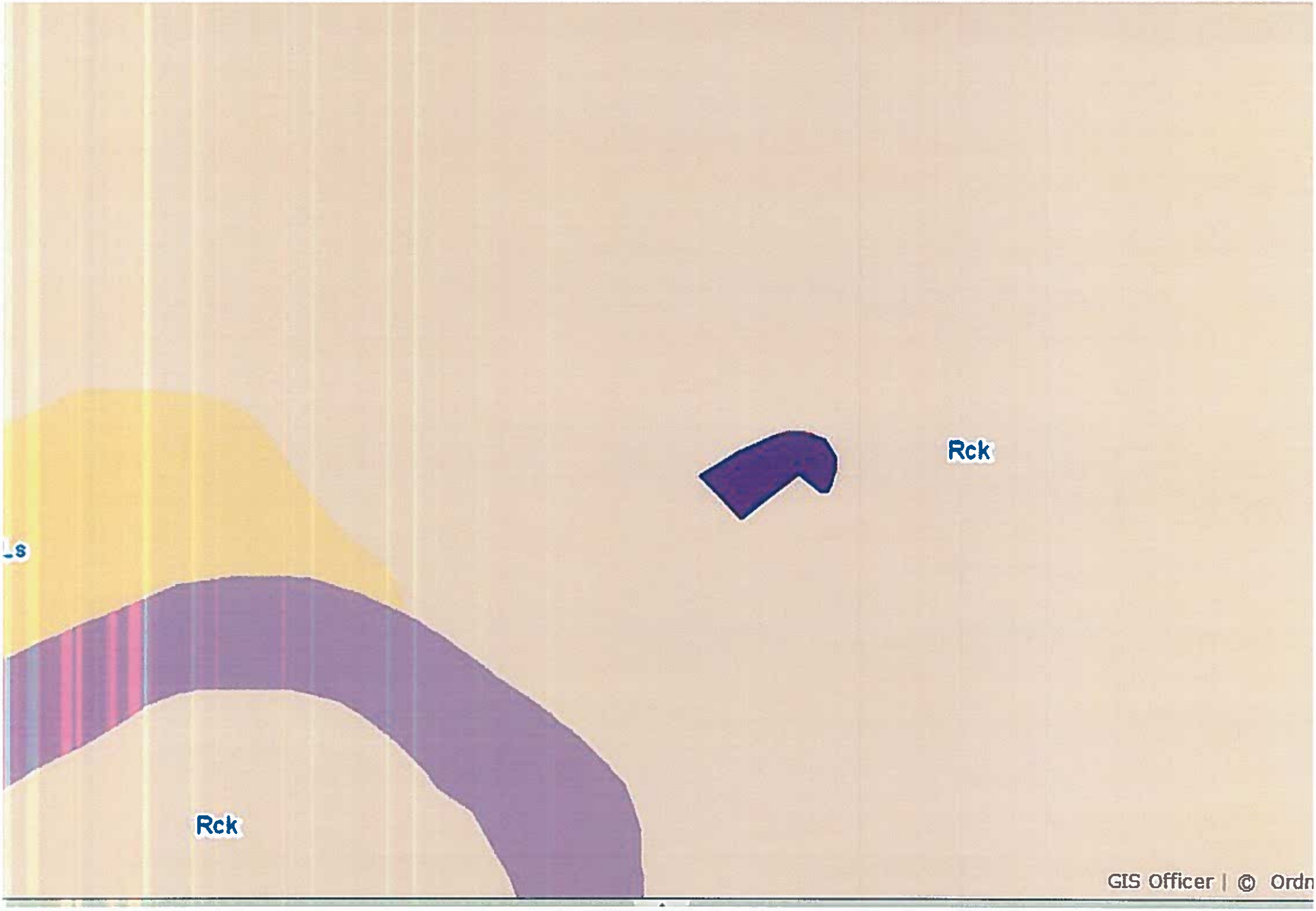
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Appendix 2

Site Walkover checklist and Photo Log

Walkover Survey Checklist

Oldcourt Historic Landfill Co. Kilkenny

Walkover Survey Checklist		
Information	**Checked**	**Comment (include distances from Site Boundary)**
1. What is the current land use?	✓	Unregistered Land
2. What are the neighbouring land uses?	✓	Agricultural, forested area to the south of the site between site boundary and River Nore
3. What is the size of the site?	✓	0.6 ha
4. What is the topography?	✓	The site comprises a steep valley, the topography falls from the east and west boundarys to create the base of the valley and the site as a whole falls to the south. A stream runs along the top boundary of the site. The site is fully forested.
5. Are there potential receptors (if yes, give details)?	✓	Stream on site
Houses	✓	Nearest dwelling approximately 45 m from eastern site boundary
Surface water features (if yes, distance and direction of flow)?	✓	Yes, runs east to south west along the northern site boundary
Any wetland or protected areas?	✓	River Barrow and River Nore SAC 0.25 km southwest of site boundary
Public water supplies?	✓	Groundwater drinking water protection area 4.5km north west of site boundary
Private wells?	✓	Nearest domestic borehole recorded at 1.5 and 1.8 km from site boundary.
Services?	✓	No
Other buildings?	✓	No
Other?		
6. Are there any potential sources of contamination (if yes, give details)?		
Surface waste (if yes, what type)?	✓	Yes, stream running along northern site boundary
Surface ponding of leachate	✓	No
Leachate seepage	✓	No
Landfill gas odours	✓	No
7. Are there any outfalls to surface water? (If yes, are there discharges and what is the nature of the discharge?)	✓	No
8. Are there any signs of impact on the environment? (if yes, take photographic evidence)	✓	Small amount of litter
Vegetation die off, bare ground	✓	No

Walkover Survey Checklist

Oldcourt Historic Landfill Co. Kilkenny

Information	Checked	Comment (include distances from Site Boundary)
Leachate seepages	✓	No
Odours	✓	No
Litter	✓	Small amount of litter on north/eastern site boundary, rest of site inaccessible
Gas bubbling through water	✓	No
Signs of settlement	✓	No
Subsidence, water logged areas	✓	No
Drainage or hydraulic issues	✓	No
Downstream water quality appears poorer than upstream water quality	✓	Not tested
9. Are there any indications of remedial measures? (Provide details)		
Capping	✓	Possibly fly tipping site, cannot determine if capped
Landfill gas collection	✓	No
Leachate collection	✓	No
10. Describe fences and security features (if any)	✓	Site fully fenced
Any other relevant information?		

PHOTOGRAPHIC LOG

Consultants in Engineering and Environmental Sciences

www.fehilytimoney.ie

FEHILY TIMONEY & COMPANY

Client Name: Kilkenny County Council	Site Location: Oldcourt, Inistioge, Co. Kilkenny	Project Number: P1725

Photo No.1	Date: 21/08/2018

Description:

Oldcourt site access by foot from west of site

Photo No.2	Date: 21/08/2018

Description:

Stream running along western site boundaries

PHOTOGRAPHIC LOG

Consultants in Engineering and Environmental Sciences

www.fehilytimoney.ie

FEHILY TIMONEY & COMPANY

Client Name: Kilkenny County Council	Site Location: Oldcourt, Inistioge, Co. Kilkenny	Project Number: P1725

Photo No.3	Date: 21/08/2018

Description:

Stream continuing along northern site boundary

Photo No.4	Date: 21/08/2018

Description:

Slope up from stream to road edge

PHOTOGRAPHIC LOG

Consultants in Engineering and Environmental Sciences

www.fehilytimoney.ie

FEHILY TIMONEY & COMPANY

Client Name: Kilkenny County Council	Site Location: Oldcourt, Inistioge, Co. Kilkenny	Project Number: P1725

Photo No.5	Date: 21/08/2018

Description:

Slope down from stream, falling southward and dried up stream path

Photo No.6	Date: 21/08/2018

Description:

Plastic litter on slope face up to road

PHOTOGRAPHIC LOG

Consultants in Engineering and Environmental Sciences

www.fehilytimoney.ie

FEHILY TIMONEY & COMPANY

Client Name: Kilkenny County Council	Site Location: Oldcourt, Inistioge, Co. Kilkenny	Project Number: P1725

Photo No.7	Date: 21/08/2018

Description:

Culverted stream on northern site boundary and fence between site and adjacent road

Photo No. 8	Date: 21/08/2018

Description:

Small flat area on the eastern of the site

PHOTOGRAPHIC LOG

Consultants in Engineering and Environmental Sciences

www.fehilytimoney.ie

FEHILY TIMONEY & COMPANY

Client Name: Kilkenny County Council	Site Location: Oldcourt, Inistioge, Co. Kilkenny	Project Number: P1725

Photo No.9	Date: 21/08/2018

Description:

Small flat area on the eastern of the site

Photo No.10	Date: 21/08/2018

Description:

Trees and overgrowth common throughout entire site